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Borealis Polymers Oy

New Claims

1. Process for preparing an olefin polymerisation catalyst component in the form of particles having a predetermined size range, said process comprising the steps of:

a) preparing a solution of a complex of a Group 2 metal and an electron donor by reacting a compound of said metal with said electron donor or a precursor thereof in an organic liquid reaction medium;

b) adding said solution of said complex to at least one compound of a transition metal to produce an emulsion the dispersed phase of which contains more than 50 mol% of the Group 2 metal in said complex;

c) agitating the emulsion in order to maintain the droplets of said dispersed phase within such an average size range of 5 to 200μm;

d) solidifying said droplets of the dispersed phase;

e) recovering the solidified particles of the olefin polymerisation catalyst component;

wherein an aluminium compound of the general formula $AlR_{3-n}X_n$ wherein R stands for a straight chain or branched alkyl group having 1 to 20, preferably 1 to 10 and more preferably 1 to 6 carbon atoms, X stands for halogen and n stands for 0, 1, 2 or 3, is added and brought into contact with the droplets of the dispersed phase of the agitated emulsion before recovering the solidified particles in step e).

2. The process of claim 1, wherein, in step c), the emulsion is agitated in the presence of an emulsion stabilizer and/or a turbulence minimizing agent (TMA).

3. The process of claim 1 or 2, further comprising washing and drying said solidified particles prior to recovering in step e) and wherein the aluminium compound of the general formula $AlR_{3-n}X_n$ is added and brought into contact with the droplets of the dispersed phase of the agitated emulsion or the solidified particles before recovering the solidified particles in step e).

4. A process according to any preceding claim wherein the aluminium compound of the general formula $AlR_{3-n}X_n$ is brought into contact with the droplets of the dispersed phase of the agitated emulsion before recovering the solidified particles in step e) in an amount so that the final catalyst particles have Al content of 0,05 to 1 %, preferably 0,1 to 0,8 %, most preferably 0,2 to 0,7 % by weight.

5. A process according to any preceding claim wherein an aluminium compound of the general formula $AlR_{3-n}X_n$ wherein R stands for a straight chain or branched alkyl group having 1 to 6 carbon atoms, X stands for chlorine and n stands for 0, 1, or 2, is used.

6. A process according to claim 5, wherein n is 0 and R is ethyl.

7. A process according to any preceding claim wherein said Group 2 metal is magnesium.

8. A process according to any preceding claim wherein said liquid organic medium comprises a C_6-C_{10} aromatic hydrocarbon or a mixture of C_6-C_{10} aromatic hydrocarbon and C_5 - C_9 aliphatic hydrocarbons.

9. A process according to any preceding claim wherein said liquid reaction medium comprises toluene.

10. A process according to any preceding claim wherein said electron donor is a mono- or diester of an aromatic carboxylic acid or diacid.

11. A process according to claim 10 wherein said aromatic carboxylic acid ester or diester is formed in situ by reaction of an aromatic carboxylic acid chloride or diacid dichloride with a C_2-C_{16} alkanol and/or diol.

12. A process according claim 10 or 11 wherein said aromatic carboxylic acid ester is dioctyl phthalate.

13. A process according to any preceding claim wherein the preparation of the Group 2 metal complex is carried out at a temperature of 20° to 80°C.

14. A process according to 13 wherein the Group 2 metal is magnesium and the preparation of the magnesium complex is carried out at a temperature of 50° to 70°C.

15. A process according to any preceding claim wherein said transition metal is a Group 4 metal, a Group 5 metal and/or a Group 6 metal or mixtures thereof.

16. A process according to any of claim 1 to 14 wherein said transition metal is Cu, Fe, Co, Ni and/or Pd.

17. A process according to claim 15 wherein said Group 4 metal is titanium.

18. A process according to any of claims 15 to 17 wherein said compound of the transition metal is a halide.

19. A process according to any preceding claim wherein the mol ratio of the transition metal metal/ Group 2 metal of said disperse phase is 20 to 80.

20. The process according to claim 19 wherein the mol ratio of the transition metal/ Group 2 metal of said disperse phase is 45 to 75.

21. The process according to any preceding claim wherein said Group 2 metal complex and said transition metal compound are reacted at a temperature of 10° to 60°C.

22. A process according to claim 21 wherein said Group 2 metal complex is a magnesium complex and said transition metal compound is a Group 4 metal compound which are reacted in a temperature range from 20° to 50°C.

23. A process according to any preceding claim wherein said emulsion is composed of a first dispersed phase which is a toluene/$TiCl_4$-insoluble-oil having a Group 4 metal/Mg mol ratio greater than 0.1 and less than 10 and a second disperse phase which is an oil less dense than that of the dispersed phase and which has a Group 4 metal/Mg mol ratio of 10 to 100.

24. A process according to claim 23 wherein the Group 4 metal/Mg mol ratio of said denser oil is 2 to 4 and that of the disperse phase oil is 55 to 65.

25. A process according to claim 23 or 24 wherein the ratio

of the mol ratio Group 4 metal/Mg in the disperse phase oil to that in said denser oil is at least 10.

26. A process according to any of claims 2 to 25 wherein said emulsion stabilizer is a surfactant.

27. A process according to claim 26 wherein said surfactant comprises an acrylic polymer or methacrylic polymer.

28. A process according to any of claims 2 to 27 wherein the turbulence minimizing agent is added to the reaction mixture before solidifying said droplets of the dispersed phase, said TMA being inert and soluble in the reaction mixture under the reaction conditions.

29. A process according to claim 28 wherein the turbulence minimizing agent is preferably a polymer having linear aliphatic carbon backbone chains, optionally having short side chains, said polymer being preferably selected from α-olefin polymers having a high molecular weight of MW about 1 - 40 x 10^6, or mixtures thereof.

30. A process according to claim 28 or 29 wherein the turbulence minimizing agent is selected from the group consisting of polymers of α-olefin monomers with 6 to 20 carbon atoms or mixtures thereof.

31. A process according to claim 30 wherein the turbulence minimizing agent is selected from polymers of octene, nonene, decene, undecene, dodecene, copolymers or mixtures of polymers thereof.

32. A process according to any of claims 2 to 31 wherein

the turbulence minimizing agent is added to the emulsion in an amount of 1 to 1.000 ppm, preferably 5 to 100 ppm and more preferable 5 to 50 ppm.

33. Particles of the catalyst component obtainable to the process of any of claims 1 to 32.

34. An olefin polymerisation catalyst comprising particles of the catalyst component obtainable according to the process of any of claims 1 to 32 and a cocatalyst, preferably an alkylaluminium cocatalyst and optionally an external electron donor.

35. Use of a catalyst in accordance with claim 34 in the process for polymerising olefins, in particular C_2 to C_{10} α-olefines, preferably propylene or ethylene or copolymers thereof with other α-olefins.